Bridge-to-Corn-Ethanol Subcontract Summary Sheet
Delta-T Corporation
Technical Advisor: Andy Aden

Industrial Partner: Power Energy Technologies
Other Partners: Brelsford

Starch to Ethanol Process Information

Feedstock: Corn
Facility Capacity: 19.2 MM gal/yr
Ethanol Yield: 2.7 gallons/bushel
Other Products: Currently DDGS & Wet grain

Biomass Process Information – Dilute Acid

Size of Biomass Process: 3.6 MM gal/yr
Ethanol Yield: ~ 67 gal / dry ton
Feedstock: Wet Grains
Process: Brelsford 2-stage dilute acid pretreatment w/ neutralization & co-fermenting organism
Fermentative Organism: Zymomonas mobilis
Steam: Produced on-site by new higher pressure boiler
Electricity: Purchased
Other Information: Pretreated and neutralized material is combined w/ existing sugar stream in dry mill and fermented

Links with Existing Facility

Wet grains from the existing dry mill (after centrifuge) are fed into biomass processing. Neutralized hydrolysate is recombined w/ existing flow to fermentors. Existing fermentors are used, but new fermentation organism is used (Zymo).

Capital and Operating Costs

Biomass Plant Capital Investment: $6.1 MM
Total Operating Costs: $2.18 MM/yr
Feedstock Cost: N/A
Chemical and Disposal Cost: $1.09 MM

Proforma

Ethanol Selling Price: $1.10 / gal
Payback: 3.42 years
Plant Life: N/A
Financing: N/A
Depreciation: N/A

Sensitivity Analysis

Corn feedrate reduced by 15% to account for existing process at capacity in distillation/evaporation section.

- Results in negative payback due to decrease in DDGs production

Incremental costs of replacing low-cost vacuum filter w/ new centrifuges

- Also results in negative payback due increased capital costs

---

Biomass Process Information – Gasification

Size of Biomass Process: 15 MM gal/yr
Ethanol Yield: unknown (seems to calculate to ~200 gal/dry ton)
Feedstock: Corn Stover
Process: Biomass gasification w/ catalytic conversion to alcohol fuels
Fermentative Organism: N/A
Steam: Produced on-site
Electricity: Purchased
Other Information: 8400 hrs/yr

Links with Existing Facility

N/A

Capital and Operating Costs

Biomass Plant Capital Investment: $48.2 MM
Total Operating Costs: $10.1 MM/yr
Feedstock Cost: $15/dry ton
Chemical and Disposal Cost: $2.71 MM

Proforma

Ethanol Selling Price: annualized cost per undenatured gallon ethanol = $1.273
Plant Life: N/A
Financing: 10% interest rate for 8 years
Depreciation: N/A

Sensitivity Analysis

None

Strengths of Subcontract

Detailed analysis of Brelsford process in real world setting
Alternative approach to alcohol production (through gasification and catalytic conversion)
Preliminary economics for relatively unknown technology

Subcontract Recommendations/Next Steps

Explore gasification route further